

Name: _____

Answer key Score:

Product Rule

Algebra: D1

$$1) \quad 6xy \cdot xy \cdot 4y^{-5} \\ = \frac{24x^2}{y^3}$$

$$2) \quad 5pq \cdot qr \cdot pr \\ = 5p^2q^2r^2$$

$$3) \quad (9mn)(4n^2)(3m^2) \\ = 108m^3n^3$$

$$4) \quad 4ab^8 \cdot ab \cdot 9b^{-4} \\ = 36a^2b^5$$

$$5) \quad (5c^2d)(2d)(7cd^2) \\ = 70c^3d^4$$

$$6) \quad 2klm \cdot 7lm \cdot 4km \\ = 56k^2l^2m^3$$

$$7) \quad (7g^2h)(3gh^2) \\ = 21g^3h^3$$

$$8) \quad 8xyz \cdot 7xy^2 \\ = 56x^2y^3z$$

$$9) \quad 3rs^4 \cdot st \cdot 2t^{-4} \\ = \frac{6rs^5}{t^3}$$

$$10) \quad 2uv^6 \cdot 4u^{-8}v \cdot 5u^{-5} \\ = \frac{40v^7}{u^{12}}$$

$$11) \quad (9p^{-4}q)(4p)(3pq^{-5}) \\ = \frac{108}{p^2q^4}$$

$$12) \quad 7abc \cdot 4bc^2 \\ = 28ab^2c^3$$

$$13) \quad (6s^4t)(2st^6) \\ = 12s^5t^7$$

$$14) \quad 2xy^4z \cdot 5xy^3z \\ = 10x^2y^7z^2$$

$$15) \quad 4pq^5 \cdot q^4r \cdot 7r^7 \\ = 28pq^9r^8$$

$$16) \quad 7bc \cdot 3bc \cdot 6c^{-4} \\ = \frac{126b^2}{c^2}$$

$$17) \quad 8qr \cdot rs \cdot qs^8 \\ = 8q^2r^2s^9$$

$$18) \quad (6yz)(2y^2)(4z^2) \\ = 48y^3z^3$$

Name: _____

Answer key Score:

Exponent Rules

Algebra: M1

1) $\left(\frac{x^7y^3}{x^2y}\right)^4$ $= x^{20}y^8$	2) $(a^3b)^4(ab^6)^2$ $= a^{14}b^{16}$	3) $\left(\frac{8m^5n^7}{2mn^5}\right)^3$ $= 64m^{12}n^6$
4) $(5p^3q^2)(2p^4q)^2$ $= 20p^{11}q^4$	5) $\frac{(8k^{-5})(2k^3)}{4k^{-6}}$ $= 4k^4$	6) $(b^{-3}c^{-7})^{-2}(b^3c^{-2})^{-3}$ $= \frac{c^{20}}{b^3}$
7) $\left(\frac{6lm^2}{3l^3m^6}\right)^2$ $= \frac{4}{l^4m^8}$	8) $\left(\frac{2r^{-5}s^6}{r^3s^4}\right)(3r^9s^{-4})$ $= \frac{6r}{s^2}$	9) $(u^{-3}v^5)\left(\frac{9u^{-5}v^2}{3u^6v^{-8}}\right)$ $= \frac{3v^{15}}{u^{14}}$
10) $\frac{8v^5w^{-6}}{(2v^{-3}w^2)(v^6w)}$ $= \frac{4v^2}{w^9}$	11) $\left(\frac{3s^{-2}t^7}{6s^3t^{-5}}\right)^{-4}$ $= \frac{16s^{20}}{t^{48}}$	12) $(3l^{-2}m^3)(2m^{-5})^2(lm^4)^{-3}$ $= \frac{12}{l^5m^{19}}$
13) $(4u^2v)^{-3}(u^{-5}v^6)^2(u^{-8}w^{-9})$ $= \frac{v^9}{64u^{24}w^9}$	14) $\left(\frac{6x^{-3}y^5}{2xy^2z^6}\right)^5$ $= \frac{243y^{15}}{x^{20}z^{30}}$	15) $\frac{(2a^{-3}b)(6b^5c^{-7})}{4c^{-9}}$ $= \frac{3b^6c^2}{a^3}$

Name: _____

Answer key Score:

Exponent Rules

Algebra: D1

1) $\left(\frac{3n}{5m^{-3}}\right)^2 \left(\frac{3m^4}{2n^2}\right)^{-3}$ $= \frac{8n^8}{75m^6}$	2) $\left(\frac{a^2b}{b^{-3}c^4}\right)^3 (a^{-3}b)^{-2}$ $= \frac{a^{12}b^{10}}{c^{12}}$	3) $(5x^3y^{-3})^{-2}(2x^5y^{-4})^{-3}$ $= \frac{y^{18}}{200x^{21}}$
4) $\frac{(3p^2)^3(2p^2)}{p^{-1}p^{-3}}(3p^2)^{-3}$ $= 2p^6$	5) $\frac{3^{-2}s^5(s^{-1})^{-3}}{s(s^2)^{-4}}$ $= \frac{s^{15}}{9}$	6) $\frac{(-3u^{-3}v)^2(2u^4v^{-2})^3}{(u^5v^{-6})^{-4}(6uv^{-5})}$ $= \frac{12u^{25}}{v^{23}}$
7) $(p^{-3}q^2)^{-4} \left(\frac{4p^2q^{-3}}{2p^{-8}q^7}\right)^2$ $= \frac{4p^{32}}{q^{28}}$	8) $\frac{2^{-5}l^3(m^2n^{-4})^{-3}}{(l^6m)^{-2}(m^{-3}n^{-5})^2}$ $= \frac{l^{15}m^2n^{22}}{32}$	9) $\left(\frac{x^{-2}(y^5z^{-2})^3}{(x^{-5}y^6z^{-2})^{-5}(x^3y^{-8})^{-2}}\right)^{-3}$ $= \frac{x^{63}z^{48}}{y^{87}}$
10) $\left(\frac{(4s^3t^{-2})(2t^{-3}u^5)}{8u^7}\right)^2$ $= \frac{s^6}{t^{10}u^4}$	11) $\frac{(-3)^2(l^{-2}m^{-4}n^5)^{-3}}{(6m^2n^{-4})^2(l^3m^{-6})^{-4}}$ $= \frac{l^{18}}{4m^{16}n^7}$	12) $\left(\frac{-6r^{-2}s^{-3}}{3r^2s^{-5}}\right)^2 \left(\frac{4r^3s^{-6}}{2r^{-5}s}\right)^3$ $= \frac{32r^{16}}{s^{17}}$
13) $\left(\frac{6x^7y^{-3}}{(x^5y^{-2})(2xy^3)}\right)^3$ $= \frac{27x^3}{y^{12}}$	14) $\frac{(4a^2b^{-3})^2(b^{-7}c^8)^{-3}}{(2b^3c^{-5})^3(a^{-5}b^{-6})^{-4}}$ $= \frac{2}{a^{16}b^{18}c^9}$	15) $\left(\frac{(2p^{-3}q^6)^3(q^{-5}r^6)^{-2}}{(p^2q^{-3})^{-4}(-3p^{-3}q^5r^{-2})^2}\right)^2$ $= \frac{64p^{10}q^{12}}{81r^{16}}$

Radicals and Rational Exponents

Write each expression in radical form.

1) $7^{\frac{1}{2}}$

$\sqrt{7}$

2) $4^{\frac{4}{3}}$

$(\sqrt[3]{4})^4$

3) $2^{\frac{5}{3}}$

$(\sqrt[3]{2})^5$

4) $7^{\frac{4}{3}}$

$(\sqrt[3]{7})^4$

5) $6^{\frac{3}{2}}$

$(\sqrt{6})^3$

6) $2^{\frac{1}{6}}$

$\sqrt[6]{2}$

Write each expression in exponential form.

7) $(\sqrt{10})^3$

$10^{\frac{3}{2}}$

8) $\sqrt[6]{2}$

$2^{\frac{1}{6}}$

9) $(\sqrt[4]{2})^5$

$2^{\frac{5}{4}}$

10) $(\sqrt[4]{5})^5$

$5^{\frac{5}{4}}$

11) $\sqrt[3]{2}$

$2^{\frac{1}{3}}$

12) $\sqrt[6]{10}$

$10^{\frac{1}{6}}$

Write each expression in radical form.

13) $(5x)^{-\frac{5}{4}}$

$\frac{1}{(\sqrt[4]{5x})^5}$

14) $(5x)^{-\frac{1}{2}}$

$\frac{1}{\sqrt{5x}}$

15) $(10n)^{\frac{3}{2}}$

$(\sqrt{10n})^3$

16) $a^{\frac{6}{5}}$

$(\sqrt[5]{a})^6$

$$17) (6v)^{1.5}$$

$$(\sqrt{6v})^3$$

$$18) m^{-\frac{1}{2}}$$

$$\frac{1}{\sqrt{m}}$$

Write each expression in exponential form.

$$19) (\sqrt[4]{m})^3$$

$$m^{\frac{3}{4}}$$

$$20) (\sqrt[3]{6x})^4$$

$$(6x)^{\frac{4}{3}}$$

$$21) \sqrt[4]{v}$$

$$v^{\frac{1}{4}}$$

$$22) \sqrt{6p}$$

$$(6p)^{\frac{1}{2}}$$

$$23) (\sqrt[3]{3a})^4$$

$$(3a)^{\frac{4}{3}}$$

$$24) \frac{1}{(\sqrt{3k})^5}$$

$$(3k)^{-\frac{5}{2}}$$

Simplify.

$$25) 9^{\frac{1}{2}}$$

$$3$$

$$26) 343^{-\frac{4}{3}}$$

$$\frac{1}{2401}$$

$$27) 1000000^{\frac{1}{6}}$$

$$10$$

$$28) 36^{\frac{3}{2}}$$

$$216$$

$$29) (x^6)^{\frac{1}{2}}$$

$$x^3$$

$$30) (9n^4)^{\frac{1}{2}}$$

$$3n^2$$

$$31) (64n^{12})^{-\frac{1}{6}}$$

$$\frac{1}{2n^2}$$

$$32) (81m^6)^{\frac{1}{2}}$$

$$9m^3$$

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Name : _____

Score : _____

Answer key

Standard and Scientific Notations

Mixed: MS2

Express each number in scientific notation.

1) $0.00000927 = \underline{9.27 \times 10^{-6}}$

2) $85,000,000 = \underline{8.5 \times 10^7}$

3) $4,202,100 = \underline{4.2021 \times 10^6}$

4) $0.0000000000037 = \underline{3.7 \times 10^{-11}}$

5) $1,000,000,000 = \underline{1 \times 10^9}$

Express each number in standard notation.

6) $6.024 \times 10^{-13} = \underline{0.00000000000006024}$

7) $2.13 \times 10^{11} = \underline{213,000,000,000}$

8) $1.2 \times 10^{-8} = \underline{0.000000012}$

9) $3.7 \times 10^{-9} = \underline{0.0000000037}$

10) $5.002 \times 10^6 = \underline{5,002,000}$

Name : _____

Answer Key

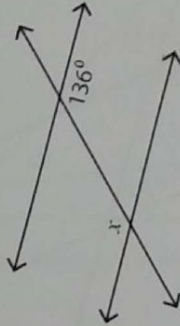
Score : _____

Angles in Transversal

Easy: 51

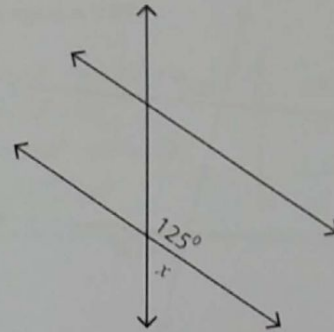
Find the value of x .

1)



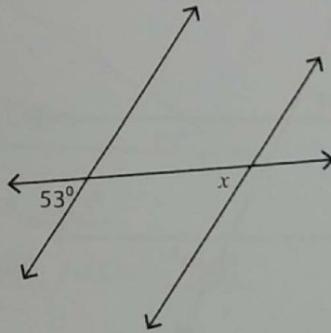
$$x = \underline{136^\circ}$$

2)



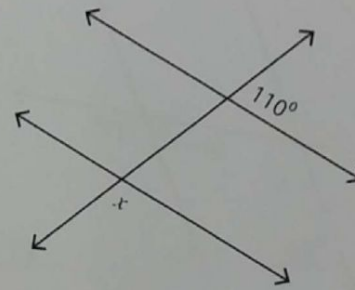
$$x = \underline{55^\circ}$$

3)



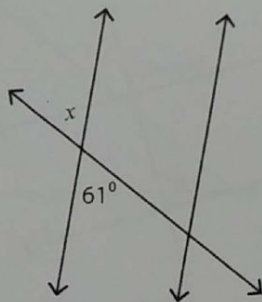
$$x = \underline{53^\circ}$$

4)



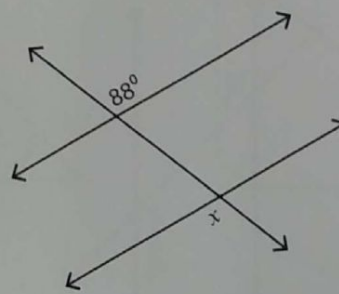
$$x = \underline{70^\circ}$$

5)



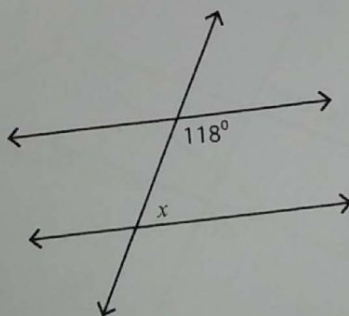
$$x = \underline{61^\circ}$$

6)



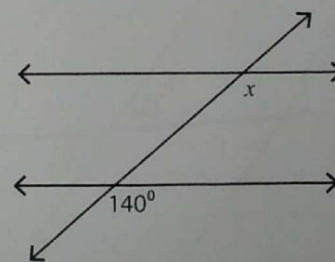
$$x = \underline{88^\circ}$$

7)



$$x = \underline{62^\circ}$$

8)



$$x = \underline{140^\circ}$$

Name : _____

Answer Key

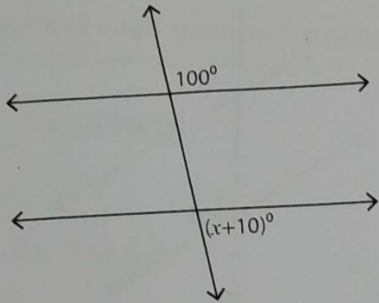
Score : _____

Moderate: S1

Angles in Transversal

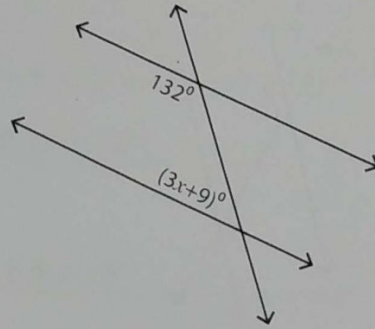
Find the value of x .

1)



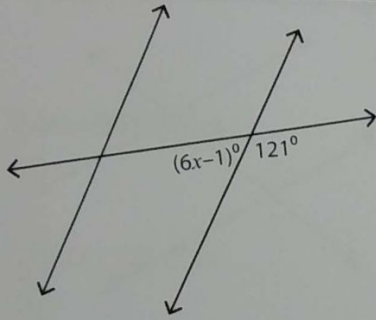
$x = \underline{70}$

2)



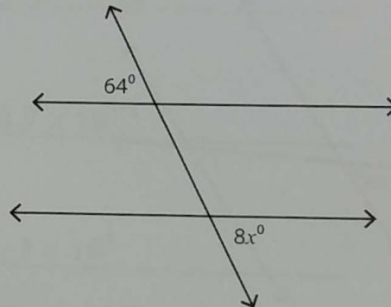
$x = \underline{13}$

3)



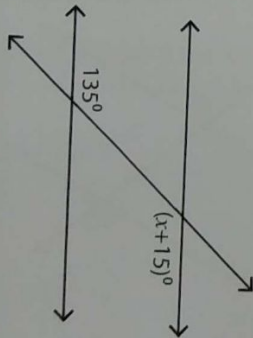
$x = \underline{10}$

4)



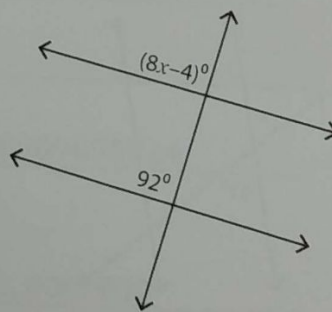
$x = \underline{8}$

5)



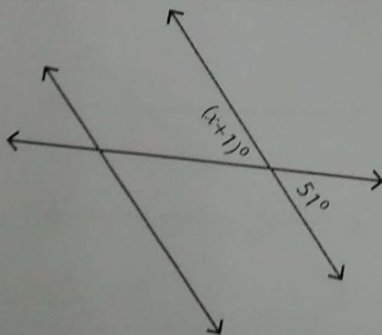
$x = \underline{120}$

6)



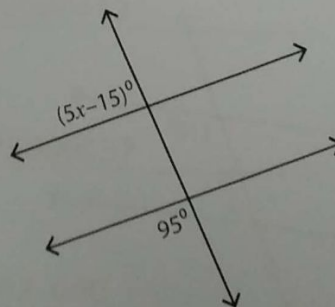
$x = \underline{12}$

7)



$x = \underline{50}$

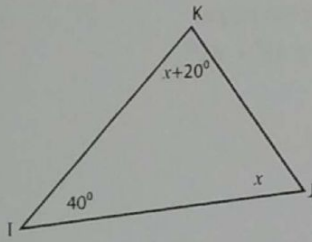
8)



$x = \underline{20}$

Triangle - Interior Angle

Example:



Sum of the interior angles = 180°

Sum of the interior angles = $40^\circ + x + 20^\circ + x$

$180^\circ = 60^\circ + 2x$

$2x = 180^\circ - 60^\circ = 120^\circ$

$x = \frac{120^\circ}{2} = 60^\circ$

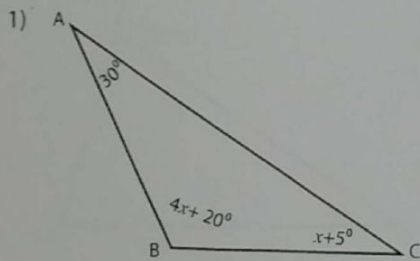
$\angle K = x + 20^\circ$

$\angle K = 60^\circ + 20^\circ$

$\angle K = 80^\circ$

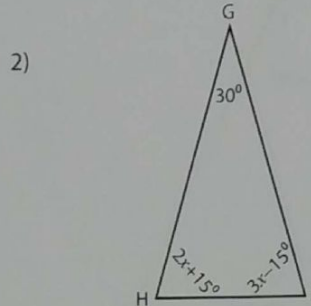
$\angle J = 60^\circ$

Find the value of x and unknown interior angles for each triangle.



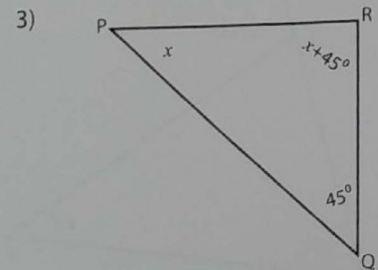
$x = \underline{25^\circ}$

$\angle B = \underline{120^\circ}$; $\angle C = \underline{30^\circ}$



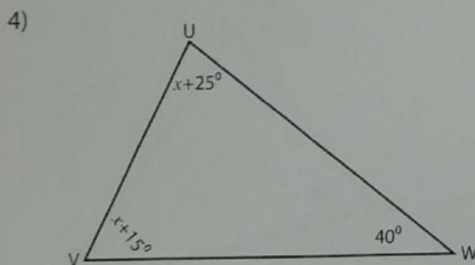
$x = \underline{30^\circ}$

$\angle H = \underline{75^\circ}$; $\angle I = \underline{75^\circ}$



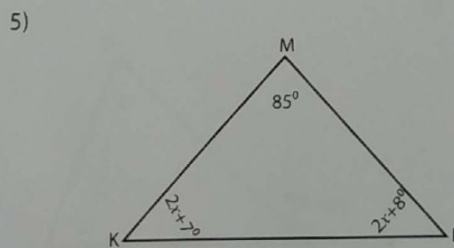
$x = \underline{45^\circ}$

$\angle P = \underline{45^\circ}$; $\angle R = \underline{90^\circ}$



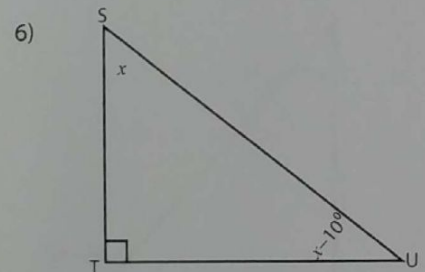
$x = \underline{50^\circ}$

$\angle U = \underline{75^\circ}$; $\angle V = \underline{65^\circ}$



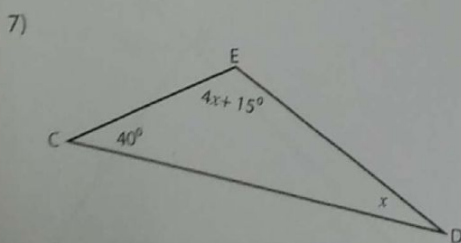
$x = \underline{20^\circ}$

$\angle K = \underline{47^\circ}$; $\angle L = \underline{48^\circ}$



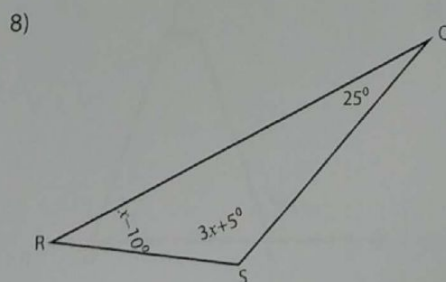
$x = \underline{50^\circ}$

$\angle S = \underline{50^\circ}$; $\angle U = \underline{40^\circ}$



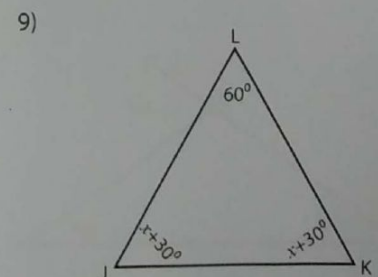
$x = \underline{25^\circ}$

$\angle D = \underline{25^\circ}$; $\angle E = \underline{115^\circ}$



$x = \underline{40^\circ}$

$\angle R = \underline{30^\circ}$; $\angle S = \underline{125^\circ}$

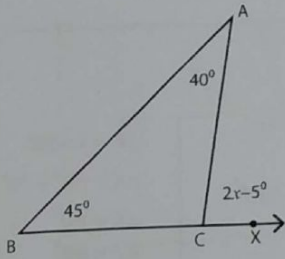


$x = \underline{30^\circ}$

$\angle J = \underline{60^\circ}$; $\angle K = \underline{60^\circ}$

Triangle - Exterior Angle

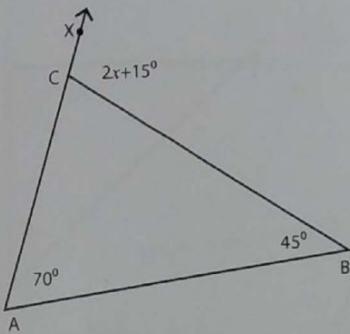
The measure of an exterior angle of a triangle is equal to sum of the measures of opposite interior angles.



Exterior angle : $\angle ACX$
 Opposite interior angles : $\angle A$ and $\angle B$
 Exterior angle = Sum of opposite interior angles
 $\angle ACX = \angle A + \angle B = 40^\circ + 45^\circ = 85^\circ$
 $\angle ACX = 2x - 5^\circ$
 $2x - 5^\circ = 85^\circ$
 $2x = 85^\circ + 5^\circ$
 $2x = 90^\circ$
 $x = \frac{90^\circ}{2} = 45^\circ$

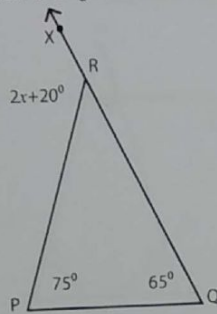
Find the unknown exterior angle and the value of x for each triangle.

1)



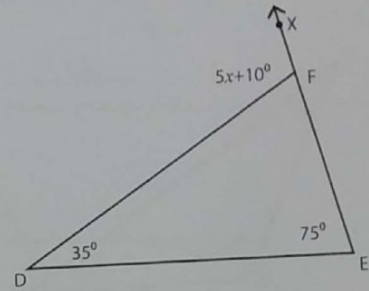
$\angle BCX = 115^\circ ; x = 50^\circ$

2)



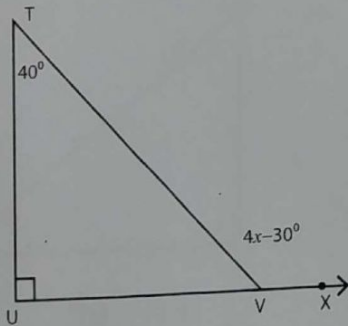
$\angle PRX = 140^\circ ; x = 60^\circ$

3)



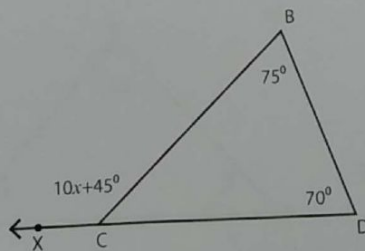
$\angle DFX = 110^\circ ; x = 20^\circ$

4)



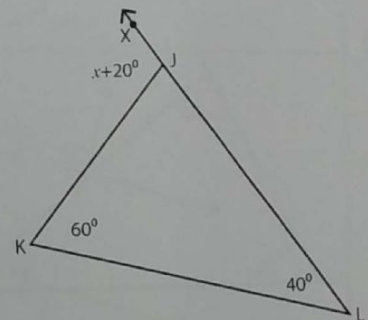
$\angle TVX = 130^\circ ; x = 40^\circ$

5)



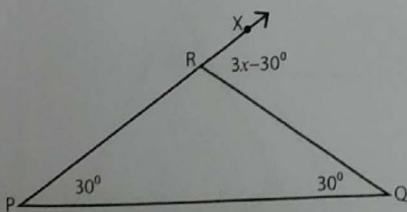
$\angle BCX = 145^\circ ; x = 10^\circ$

6)



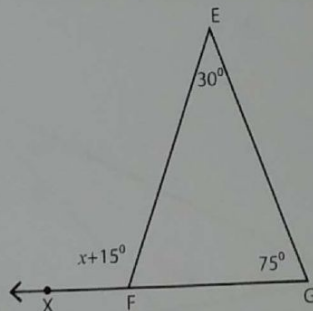
$\angle KJX = 100^\circ ; x = 80^\circ$

7)



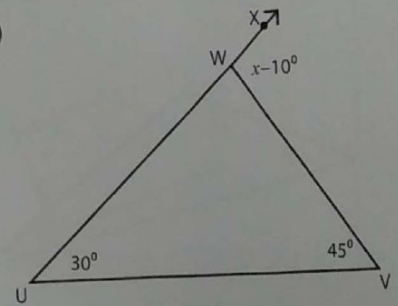
$\angle QRX = 60^\circ ; x = 30^\circ$

8)



$\angle EFX = 105^\circ ; x = 90^\circ$

9)

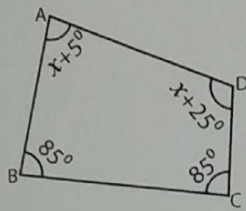


$\angle VWX = 75^\circ ; x = 85^\circ$

Answer key

Quadrilateral - Angles

Example:



Sum of the interior angles = 360°

Sum of the interior angles = $85^\circ + x + 25^\circ + x + 5^\circ + 85^\circ$

$360^\circ = 200^\circ + 2x$

$2x = 360^\circ - 200^\circ = 160^\circ$

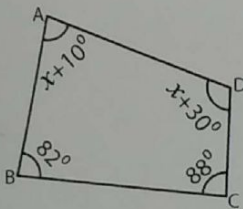
$x = \frac{160^\circ}{2} = 80^\circ$

$\angle A = x + 5^\circ = 80^\circ + 5^\circ = 85^\circ$

$\angle D = x + 25^\circ = 80^\circ + 25^\circ = 105^\circ$

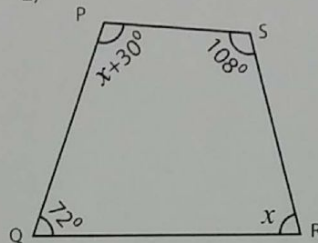
Find the missing angles in each quadrilateral.

1)



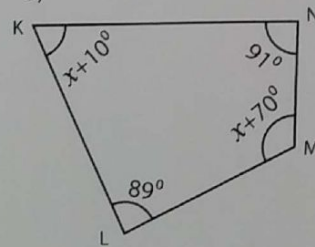
$x = 75^\circ; \angle A = 85^\circ; \angle D = 105^\circ$

2)



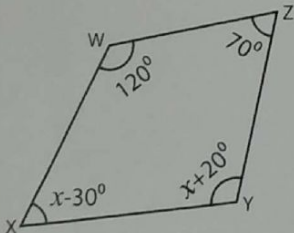
$x = 75^\circ; \angle P = 105^\circ; \angle R = 75^\circ$

3)



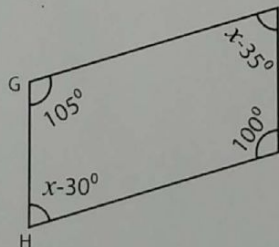
$x = 50^\circ; \angle K = 60^\circ; \angle M = 120^\circ$

4)



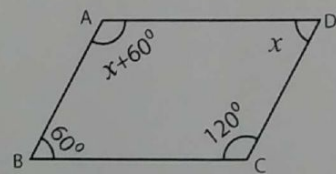
$x = 90^\circ; \angle X = 60^\circ; \angle Y = 110^\circ$

5)



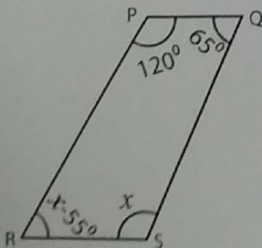
$x = 110^\circ; \angle H = 80^\circ; \angle J = 75^\circ$

6)



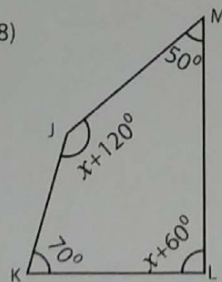
$x = 60^\circ; \angle A = 120^\circ; \angle D = 60^\circ$

7)



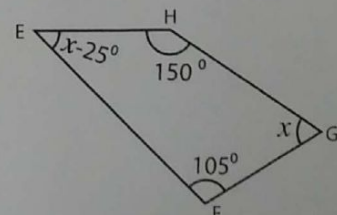
$x = 115^\circ; \angle R = 60^\circ; \angle S = 115^\circ$

8)



$x = 30^\circ; \angle J = 150^\circ; \angle L = 90^\circ$

9)



$x = 65^\circ; \angle E = 40^\circ; \angle G = 65^\circ$