

ELEMENTARY MATHEMATICS

Paper 2: Suggested Solutions

4016/02

October/November 2011

1. Topic: Algebra (Formal, Algebraic Manipulation)

(a) $\frac{3x+7}{5} = \frac{9-3x}{2}$

$5(2x+7) = 3(3-x)$

$10x+35 = 9-3x$

$13x = -26$

$x = -2$

(b) $5x = 3(x+3)$

$5x = 3x+9$

$2x = 9$

$x(2-2) = 9$

$x = \frac{9}{2}$

Group all variables containing x.

(c) $\frac{a}{2+3} + \frac{b}{2+3} = \frac{4a+b(2+3)}{(2+3)(2+3)}$

$= \frac{4a+2b+3b}{(2+3)(2+3)}$

$= \frac{4a+5b}{(2+3)(2+3)}$

$= \frac{4a+5b}{25}$

(d) $x^2 - 9 = (x+3)(x-3)$

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2. Topic: Arithmetic (Application of Mathematics in Practical Situations & Compound Interest)

(a) (i) 250 lbs. $\rightarrow$ 15.75 litres
1 lbs. $\rightarrow \frac{15.75}{250} = 0.063$ litres
100 lbs. $\rightarrow 0.063 \times 100 = 6.3$ litres

Fuel consumption of the car is 6.3 litres per 100 lbs.

(ii) (a) 8.3 litres $\rightarrow$ 100 lbs.
1 litre $\rightarrow \frac{100}{8.3} = 12.175$ lbs
60 litres $\rightarrow 12.175 \times 60 = 731.7$
 $= 732$ lbs (3 sig fig.)

(b) 100 lbs. $\rightarrow$ 8.3 litres
1 lbs. $\rightarrow \frac{8.3}{100} = 0.083$ litres
120 lbs. $\rightarrow 0.083 \times 120 = 9.96$ litres
Cost of petrol $= 9.96 \times \$1.65$
 $= \$16.38$
 $= \$16.34$ (nearest cent)

(c) (i) 5 units $\rightarrow$ \$1000
1 unit $\rightarrow \frac{1000}{5} = \200
12 units $\rightarrow 200 \times 12$
 $= \$2400$

(ii) Total amount of money $= P \left(1 + \frac{r}{100} \right)^n$
 $= \$1000 \left(1 + \frac{12}{100} \right)^5$
 $= \$1127.49$
 $= \$1127.49$ (nearest cent)

3. Topic: Angle Properties of Polygon & Geometry (Geometrical Properties of Circles)

(a) Ext. $\angle = 180^\circ - 152^\circ$

$= 28^\circ$

Number of sides $= \frac{360^\circ}{28^\circ}$

$= 13$

Sum of exterior angles of polygon is $360^\circ \Rightarrow$ Number of sides $= \frac{360^\circ}{28^\circ}$

(b) (i) (a) $\angle ACP = 90^\circ$ (C.A.T.P.)

$\angle ACP = 180^\circ - \angle ACP - \angle APC$

$= 180^\circ - 90^\circ - 36^\circ$ (Sum of $\angle$ in Δ)

$= 54^\circ$

(b) $\angle CDB = \angle ACP = 54^\circ$

$\angle CDB = \angle ACP$ (Angles in Δ O.C. = O.B.)

$= \frac{180^\circ - 54^\circ}{2}$

$= 63^\circ$

Radius $\perp$ Tangent
 $\angle A = 90^\circ$



(c) $\angle ACB = \frac{360^\circ - 126^\circ}{2}$

$= \frac{360^\circ - 126^\circ}{2}$ (Angles in Δ O.C. = O.B.)

$= 117^\circ$

$\angle$ at centre = 2 $\times$ $\angle$ at circumference



(d) $\tan 36^\circ = \frac{a}{b}$

$a = b \tan 36^\circ$

Area of quad. ACPB $= \frac{1}{2} \times a \times b$

$= \frac{1}{2} \times b \times b \tan 36^\circ$

$= \frac{1}{2} \times b^2 \tan 36^\circ$

$= 49.5 \text{ cm}^2$ (3 sig fig.)



4. Topic: Solutions to Quadratic Equations

(a) Length of the block $= x$ cm

Height of the block $= (x+1)$ cm

Width of the block $= (x-3)$ cm



Total Surface area $= 2(\text{length} \times \text{width}) + 2(\text{width} \times \text{height}) + 2(\text{length} \times \text{height})$

Total surface area $= 2x(x-3) + 2(x-3)(x+1) + 2x(x+1)$
 $= 2x^2 - 6x + 2x^2 - 2x - 3x + 2x^2 + 2x$
 $= 2x^2 - 6x + 2x^2 - 4x - 3 + 2x^2 + 2x$
 $= 6x^2 - 8x - 3$

(b) $6x^2 - 8x - 3 = 300$

$6x^2 - 8x - 303 = 0$

$3x^2 - 4x - 253 = 0$ (divided)

(c) $3x^2 - 4x - 253 = 0$

$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-253)}}{2(3)}$

$= \frac{4 \pm \sqrt{16 + 3036}}{6}$

$= \frac{4 \pm \sqrt{3052}}{6}$

$= 9.74$ or -8.54

$= 9.74$ or -8.54 (2 d.p.)

Quadratic formula formula

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Quadratic formula formula

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