Maths Revision Booklet

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Indices

1.   Without a calculator, evaluate the following:

a) $16^{\frac{1}{2}}$

b) $27^{\frac{1}{3}}$

c) $32^{\frac{1}{5}}$

d) $9^{\frac{3}{2}}$

e) $8^{\frac{5}{3}}$

f) $27^{\frac{2}{3}}$

g) $16^{\frac{3}{4}}$

h) 5^{-1}

i) 6^{-2}

j) $36^{-\frac{1}{2}}$

2.   Simplify:

a) $m^3 \times m^{-1}$

b) $d^4(d^2 + 3d)$

c) $w^{\frac{1}{2}}(w^{\frac{1}{2}} - w^{-\frac{1}{2}})$

d) $\dfrac{x^9}{x^{-3}}$

e) $\dfrac{s^4 \times s^{-1}}{s^{-3}}$

Fractions

3.   Evaluate without a calculator:

a) $2\dfrac{2}{5} + 3\dfrac{1}{3}$

b) $4\dfrac{8}{9} - 1\dfrac{5}{6}$

c) $2\dfrac{1}{9} \times 4\dfrac{1}{5}$

d) $3\dfrac{2}{3} \div 3\dfrac{3}{10}$

Brackets

4.   Expand and simplify:

a) $(x + 8)(x^2 - 5x + 2)$

b) $(3x - 1)(x^2 + 4x - 1)$

c) $(2x - 9)(3x^2 - 5x - 7)$

5.   Factorise fully:

a) $4x^2 - 25$

b) $x^2 + 2x - 48$

c) $3x^2 + 14x - 5$

d) $5x^2 - 80$

Change the Subject

6.   Change the subject of each equation to x.

a) $ax^2 + b = c$

b) $q = \dfrac{5 + 3x^2}{2}$

c) $\sqrt{x - 8} = b$

d) $g = \dfrac{\sqrt{4x + 3}}{h}$

Completing the Square

7.   Write each of these in the form $(x + a)^2 + b$.

a) $x^2 + 8x - 2$

b) $x^2 - 12x + 3$

c) $x^2 - 20x - 7$

The Discriminant

8.   By evaluating the discriminant, state the nature of the roots of these equations:

a) $x^2 - 4x - 3 = 0$ b) $x^2 + 12x + 36 = 0$ c) $2x^2 + 7x + 6 = 0$

9.   Determine the value(s) of *p* in each of the following:

a) $2x^2 + px + 4 = 0$ has **equal roots**.   b) $px^2 + 10x - 2 = 0$ has **no real roots**.


Standard Form/Scientific Notation

10.   Light travels from the sun at a speed of 3×10^8 metres/sec. If it takes light 12 hours to reach an orbiting object, how far will this object be from the sun?

11.   The prize for a large American lottery is $472 000 000. If 12 people shared this prize equally, calculate how much each person won, giving your answer in standard form, correct to 3 significant figures.

12.   The radius of a Hydrogen atom is 2.5 x 10^{-11} m. Calculate the circumference of a Hydrogen atom.

Circles

13.   An oil tank has a circular cross-section of radius 2·1 metres.

It is filled to a depth of 3·4 metres.
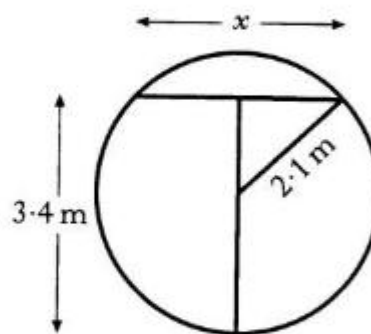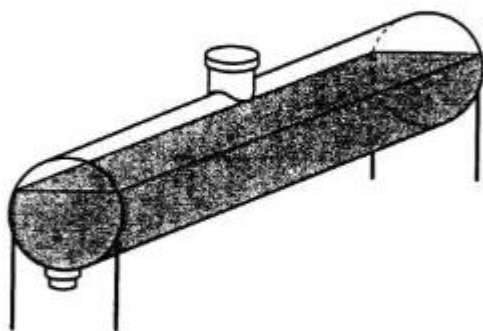
(a) Calculate *x*, the width in metres of the oil surface.

(b) What other depth of oil would give the same surface width?

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