#4-9 ba f, 10, 11

Homework - Exponential Equations Practise

A

1. Solve.

a) $2^x = 16$ b) $3^x = 27$
c) $2^x = 128$ d) $5^x = 125$
e) $4^y = 256$ f) $729 = 9^z$
g) $(-3)^x = -27$ h) $(-2)^x = -32$
i) $(-5)^a = 25$ j) $81 = (-3)^x$
k) $-2^x = -16$ l) $-4^y = -64$
m) $-5^x = -625$ n) $(-1)^x = 1$
o) $(-1)^m = -1$

2. Solve.

a) $7^{w-2} = 49$ b) $3^{x+4} = 27$
c) $2^{1-x} = 128$ d) $4^{3k} = 64$
e) $5^{3x-1} = 25$ f) $-81 = -3^{2x+8}$
g) $4^{x-1} = 1$ h) $3^{2-2x} = 1$
i) $(-1)^{2x} = 1$

3. Solve and check.

a) $6^{x+3} = 6^{2x}$ b) $2^{x+3} = 2^{2x-1}$
c) $3^{2y+3} = 3^{y+5}$ d) $2^{4x-7} = 2^{2x+1}$
e) $7^{5d-1} = 7^{2d+5}$ f) $3^{b-5} = 3^{2b-3}$

4. Solve.

a) $16^{2x} = 8^{3x}$ b) $4^t = 8^{t+1}$
c) $27^{x-1} = 9^{2x}$ d) $25^{2-c} = 125^{2c-4}$
e) $16^{2p+1} = 8^{3p+1}$ f) $(-8)^{1-2x} = (-32)^{1-x}$

5. Solve and check.

a) $2^{x+5} = 4^{x+2}$ b) $2^x = 4^{x-1}$
c) $9^{2q-6} = 3^{q+6}$ d) $4^x = 8^{x+1}$
e) $27^{y-1} = 9^{2y-4}$ f) $8^{x+3} = 16^{2x+1}$

6. Solve and check.

a) $5^{4-x} = \frac{1}{5}$ b) $10^{y-2} = \frac{1}{10\,000}$
c) $6^{3x-7} = \frac{1}{6}$ d) $3^{3x-1} = \frac{1}{81}$
e) $5^{2n+1} = \frac{1}{125}$ f) $\frac{1}{256} = 2^{2-5w}$

7. Solve and check.

a) $4^x = 8$ b) $64^z = 16$
c) $(-8)^y = -2$ d) $9^{-x} = 3$
e) $2^{9x} = \frac{1}{8}$ f) $9^{6x} = \frac{1}{27}$
g) $2^x = 16^4$ h) $2^{-2g} = 32$
i) $9^{2s+1} = 27$

8. Solve and check.

a) $9^{x+1} = 27^{2x}$ b) $16^y = 64^{2y-1}$
c) $36^{t-2} = 216^{-2t}$ d) $8^{2x-1} = 16^{x-1}$
e) $25^{1-3x} = 125^{-x}$ f) $16^{3+k} = 32^{1-2k}$

9. Solve and check.

a) $5 = 25^{\frac{x}{2}}$ b) $8 = 2^{\frac{x}{3}}$
c) $9^{\frac{y}{5}} = 27$ d) $\frac{1}{2} = 2^{\frac{a}{3}}$
e) $4^{\frac{x}{4}} = \frac{1}{8}$ f) $\left(\frac{3}{2}\right)^{\frac{m}{2}} = \frac{4}{9}$

10. Solve.

a) $3(5^{x+1}) = 15$
b) $2(3^{y-2}) = 18$
c) $5(4^x) = 10$
d) $2(4^{v+1}) = 1$
e) $2 = 6(3^{4f-2})$
f) $27(3^{3x+1}) = 3$

11. Solve and check.

a) $2^{x+2} - 2^x = 48$
b) $4^{x+3} + 4^x = 260$
c) $2^{a+5} + 2^a = 1056$
d) $6^{x+1} + 6^{x+2} = 7$
e) $3^{x+3} - 3^{x+1} = 648$
f) $10^{z+4} + 10^{z+3} = 11$
g) $2^{x+2} - 2^{x+5} = -7$
h) $3^{m+1} + 3^{m+2} - 972 = 0$
i) $5^{n+2} - 5^{n+3} = -2500$

(answers on the back)

Section 1.3, pp. 23–25

1. a) 4 b) 3 c) 7 d) 3 e) 4 f) 3 g) 3 h) 5 i) 2 j) 4 k) 4 l) 3 m) 4 n) x any even integer o) m any odd integer **2.** a) 4 b) -1 c) -6 d) 1 e) 1 f) -2 g) 1 h) 1 i) all values of x **3.** a) 3 b) 4 c) 2 d) 4 e) 2 f) -2 **4.** a) 0 b) -3 c) -3 d) 2 e) 1 f) -2 **5.** a) 1 b) 2 c) 6 d) -3 e) 5 f) 1 **6.** a) 5 b) -2 c) 2 d) -1 e) -2 f) 2 **7.** a) $\frac{3}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{3}$ d) $-\frac{1}{2}$ e) $-\frac{1}{3}$ f) $-\frac{1}{4}$ g) 16 h) $-\frac{5}{2}$ i) $\frac{1}{4}$ **8.** a) $\frac{1}{2}$ b) $\frac{3}{4}$ c) $\frac{1}{2}$ d) $-\frac{1}{2}$ e) $\frac{2}{3}$ f) $-\frac{1}{2}$ **9.** a) 1 b) 9 c) $\frac{15}{2}$ d) -3 e) -6 f) -4 **10.** a) 0 b) 4 c) $\frac{1}{2}$ d) $-\frac{3}{2}$ e) $\frac{1}{4}$ f) -1 **11.** a) 4 b) 1 c) 5 d) -1 e) 3 f) -3 g) -2 h) 4 i) 2 **12.** The equation is true for all values of

15. Application The biological half-life of thyroid hormone T4 is about 6.5 days. If a dose of T4 was not followed by repeat doses,

a) what fraction of the original dose would remain in the body after 19.5 days?

b) how long would it take until only 6.25% of the original dose would remain in the body?

16. Scuba diving The percent of sunlight, s, that reaches a scuba diver under water can be modelled by the equation

$s = 0.8^d \times 100\%$

where d is the depth of the diver, in metres.

a) At what depth does 64% of sunlight reach the diver?

b) What percent of sunlight reaches the diver at a depth of 10 m, to the nearest percent?

17. Application Determine the half-life of each isotope.

a) In 30 h, a sample of plutonium-243 decays to $\frac{1}{64}$ of its original amount.

b) In 40.8 years, a sample of lead-210 decays to 25% of its original amount.

c) In 2 min, a sample of radium-221 decays to 6.25% of its original amount.

18. Circulation Sodium-24 is used to diagnose circulatory problems. The half-life of sodium-24 is 14.9 h. A hospital buys a 40-mg sample of sodium-24. After how long will only 2.5 mg remain?

19. Solve.

a) $\frac{27^x}{9^{2x-1}} = 3^{x+4}$ b) $27^x(9^{2x-1}) = 3^{x+4}$ c) $27^{x+1} = \left(\frac{1}{9}\right)^{2x-5}$

20. Solve.

a) $2^{x^2+2x} = 2^{x+6}$ b) $3^{x^2-2x} = 3^{x-2}$ c) $2^{2x^2-3x} = 2^{x^2-2x+12}$

C

21. Half-life In 8 days, a sample of vanadium-48 decays to $\frac{1}{\sqrt{2}}$ of its original amount. Determine the half-life of vanadium-48.

22. Solve and check.

a) $\frac{2^{2x+1}}{2^{x-3}} = 4$ b) $\frac{9^{x+4}}{27^{x-1}} = 81$ c) $\frac{8^{x+2}}{4^{x+3}} = 16^{x-3}$

23. Find x and y if $\frac{16^{x+2y}}{8^{x-y}} = 32$ and $\frac{32^{x+3y}}{16^{x+2y}} = \frac{1}{8}$.

Answers:

15) a) $\frac{1}{8}$ b) 26 days **17)** 5 h b) 20.4 years **18)**59.6 h **19** a) -1 b)1 c) 1 **20** a) 2,-3 b)1,2 c) 4,-3 **21)**16 days **22**a) -2 b) 7 c) 4 **23)** x=-17, y=2