

Exponential Equations

Practice

Q3. Solve the following exponential equations:

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|-------------------------------------|----------------------------------|
| (a) $10^t = 65$ | (b) $5 \times 10^t = 120$ |
| (c) $4 \times 10^t = 5000$ | (d) $10^t \times 12 = 180$ |
| (e) $4 \times 10^t + 40 = 600$ | (f) $5 \times (10^t - 30) = 600$ |
| (g) $10^t \div 5 = 4.7$ | (h) $40 \times 10^t = 8$ |
| (i) $10 \times 10^t = 0.3$ | (j) $10^{2t} = 240$ |
| (k) $10^{-t} = 6$ | (l) $2 \times 10^{5t} = 2000$ |
| (m) $10^{(t+2)} = 4000$ | (n) $6 \times 10^{(t-2)} = 40$ |
| (o) $10 + 5 \times 10^{(t-1)} = 70$ | (p) $10^{(3t+2)} = 780\,000$ |
| (q) $15 \times 10^{4(t-3)} = 487$ | (r) $10^{(x+5)} = 43\,000$ |
| (s) $120 - 2 \times 10^{2p} = 70$ | (t) $6 \times 10^{-4t} = 0.0487$ |

Q4. The mass of a bacterial culture increases by a factor of 10 every day. If the initial mass was 20 mg, how long will it take for the mass to reach 60 000 mg?

Q5. A high-risk investment claims that your money will be multiplied by 10 every year. At that rate, how long would \$5000 take to increase to \$1 000 000?

Q6. The mass of a bacterial culture increases by a factor of 10 every hour. If the mass was 200 mg at 4 p.m., when was it 5 mg?

Practice

Q7. Evaluate the following expressions.

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|------------------------|---------------------|--------------------|
| (a) $\log_2 80$ | (b) $\log_2 3000$ | (c) $\log_2 8$ |
| (d) $\log_2 1024$ | (e) $\log_2 0.1$ | (f) $\log_5 60$ |
| (g) $\log_4 64$ | (h) $\log_{10} 400$ | (i) $\log_{1.2} 8$ |
| (j) $\log_{1.02} 3000$ | (k) $\log_{20} 7$ | (l) $\log_7 7$ |
| (m) $\log_7 49$ | (n) $\log_5 25$ | (o) $\log_5 0.2$ |

Q8. Solve the following equations.

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|---------------------------|---------------------------|
| (a) $2^t = 100$ | (b) $3 \times 5^t = 120$ |
| (c) $4 \times 3^t = 2000$ | (d) $8^t \times 10 = 180$ |

- (e) $5 \times 2^t + 60 = 440$ (f) $5 \times (4^t - 30) = 850$
 (g) $40^t \div 5 = 4.7$ (h) $20 \times 6^{2t} = 0.0032$
 (i) $60 \times 1.1^{(t+2)} = 4$ (j) $0.02 \times 2.5^{(t-2)} = 40$
 (k) $17 + 2 \times 10^{(t-1)} = 360$ (l) $2^{(2t+1)} = 0.034$
 (m) $12 \times 5^{4t-1} = 23\,272.4$ (n) $100^{(x+1)} = 779$
 (o) $30 - 2 \times 3^{2p} = 12$ (p) $5 \times 10^{-0.0024t} = 0.0487$

- Q9. A high-risk investment claims that your money will double every year. At that rate, how long would \$5000 take to increase to \$1 000 000?
- Q10. A weed on a pond triples its area every day. How long will it take to grow from 0.03 m², to 15m²?
- Q11. Adam puts \$5000 in the bank at 5% per annum compound interest. How long will it take to grow to \$7000?
- Q12. A car depreciates by 10% per year. How long will it take for the value to fall from \$20 000 to \$8 000?
- Q13. A computer depreciates by 30% per year. How long will it take for the value halve?
- Q14. The formula for the population of a city during the 1990s was $p = 217\,475 \times 1.0406^t$ where t is the time in years since 1 January 1990. In which month did the population reach 250 000?

Answers

- Q3. (a) 1.813 (b) 1.380 (c) 3.097 (d) 1.176
 (e) 2.146 (f) 2.176 (g) 1.371 (h) -0.699
 (i) -1.523 (j) 1.190 (k) -0.778 (l) 0.6
 (m) 0.602 (n) 2.824 (o) 2.079 (p) 1.297
 (q) 3.378 (r) -0.367 (s) 0.699 (t) 0.523
- Q4. 3.477 days Q5. 2.301 years Q6. 2:24 p.m.
- Q7. (a) 6.322 (b) 11.55 (c) 3 (d) 10 (e) -0.5 (f) 2.544
 (g) 3 (h) 2.602 (i) 11.41 (j) 404.3 (k) 0.650 (l) 1
 (m) 2 (n) 2 (o) -1
- Q8. (a) 6.644 (b) 2.292 (c) 5.657 (d) 1.390 (e) 9.570 (f) 3.822
 (g) 0.859 (h) -2.439 (i) -30.41 (j) 10.30 (k) 3.234 (l) -2.939
 (m) 1.426 (n) 0.446 (o) 1 (p) 838.1
- Q9. 7.644 years Q10. 5.657 days Q11. 6.896 years
 Q12. 8.70 years Q13. 1.943 years Q14. July 2003